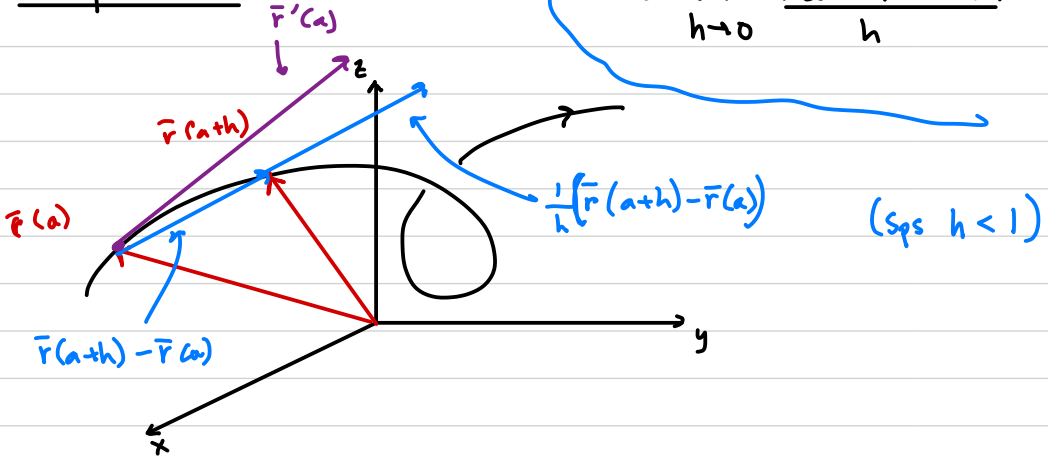
Interpretation

$$\bar{r}'(a) = \lim_{h \to 0} \frac{\bar{r}(a+h) - \bar{r}(a)}{h}$$



As $h \to 0$, $\dfrac{\bar{r}(a+h) - \bar{r}(a)}{h}$ approaches the

tangent vectors to the curve $\bar{r}(t)$ at the point $\bar{r}(a)$.

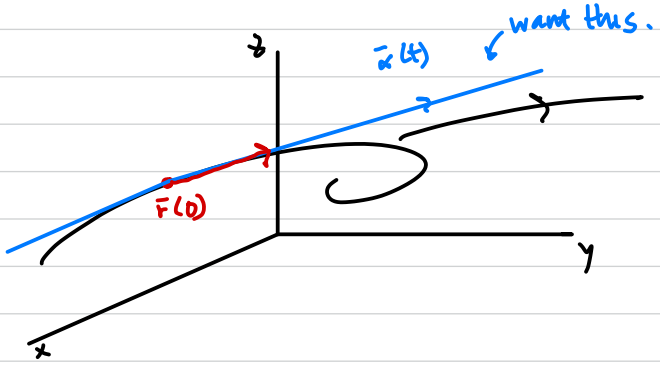
↳ points in direction of travel.

If $\bar{r}(t)$ gives position of a particle in $\mathbb{R}^3$ at time t then

- $\bar{r}'(t)$ gives velocity at time t,
- $\bar{r}''(t)$ gives acceleration at time t, and
- $|\bar{r}'(t)|$ gives speed at time t.

Ex Find tangent line to path given by

$$\bar{r}(t) = (t, t^2, e^t) \quad \text{at } t=0.$$



point: $\bar{r}(0) = (0, 0, e^0) = (0, 0, 1)$

vector: $\bar{r}'(t) = (1, 2t, e^t)$

$\bar{r}(0) = (1, 0, 1)$ ⟵ direction vector.

line: $\bar{p} + t\bar{v}$

$(0, 0, 1) + t(1, 0, 1)$

$\bar{\alpha}(t) = (t, 0, 1+t)$